

# Richmond Refinery LPS Bulletin – Reliability

## Richmond Hydrogen Plants Unplanned Shutdown



IMPACT ERM: 32339

### Location:

Richmond Hydroprocessing

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### Reference:

Investigation 19382



Example of pressure survey location and instrumentation used

### Tenets of Operations Violated:

- 1) Operate within design or environmental limits.
- 3) Ensure safety devices are in place and functioning.
- 8) Address abnormal conditions and "at risk" behaviors.
- 10) Involve the right people in the decisions that affect people, procedures, and equipment.

**URIP**  
**Design/Care/Fix/**  
**Prevent**

### Incident Description:

On February 27, 2012, a pressure survey caused the Hydrogen A-Train (H2A) B cell fuel gas control valve to go fully closed. Adequate pressure could not be maintained in the B cell burner header and F-305 went to full trip at 14:33 on low fuel gas pressure. The F-305 trip caused H2A train to shut down completely.

When H2A tripped, the first stage to K-900 booster deck fell to 90 psig, and therefore the high compression ratios caused high temperature spikes in excess of 400F, thereby damaging the compressors.

Hydrogen B-Train (H2B) furnace F-355A developed a pig tail leak at 20:31, which required the F-355A-cell to be taken offline. 20 plant was not immediately shut down and K-1900 suction pressure rose, which eventually caused the flows to begin to swing. The rise in K-1900 suction pressure along with the flow instability led to RLOP, SISO, and FCC flaring, thereby causing a flaring event.

### Investigation Findings:

- 1) Employees performing pressure survey did not understand that the fuel gas control valve closes shut due to feed forward control systems logic instead of going to min flow.
- 2) F-305 minimum flow line failed to maintain minimum pressure.
- 3) 20 plant was not shut down when hydrogen flow fell below recommended minimum of 9 MMSCFD.
- 4) Compressor suction pressure dropped suddenly from 215 psig to 90 psig.

### Recommendations:

- 1) Pilot operations should use INTEGRITY tool that is already available on their console because this tool will show the relationship between controllers.
- 2) Recommend the appropriate changes for minimum flow trip, which should include an analysis of the min flow regulator, line sizing, and control logic.
- 3) Develop operating guidelines on when to shut down 20 plant.
- 4) Modify control system and operational discipline to maintain compressor suction pressure during abnormal situations.

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